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## AGRICULTURAL RESEARCH - A NATIONAL PERSPECTIVE

THERE IS GROWING EVIDENCE THAT RESEARCH IS SLIPPING IN THIS NATION. SOME RECENT FIGURES ON THE U.S. SHARE OF RESEARCH AND ON PATENTS SUM UP, IN A SENSE, THE BASIS FOR THIS CONCERN. IN THE 10 YEARS 1963 TO 1973 THIS NATION'S SPONSORSHIP OF RESEARCH DROPPED FROM 60 TO 40 PERCENT OF THE WORLD TOTAL. IN THE SAME PERIOD THERE WAS A DROP IN U.S. PATENTS ISSUED TO AMERICANS, WHILE TWICE AS MANY PATENTS WERE GRANTED TO FOREIGNERS.

WHAT IS TRUE FOR ALL RESEARCH IS TRUE ALSO FOR AGRICULTURAL RESEARCH. THERE HAVE BEEN A STRING OF STUDIES -- BEGINNING WITH THE POUND REPORT AND INCLUDING THE RECENT NATIONAL ACADEMY OF SCIENCES "STUDY OF WORLD FOOD AND NUTRITION" -- WHICH IN ONE WAY OR ANOTHER HAVE MADE THE POINT THAT AGRICULTURAL RESEARCH, AND BASIC RESEARCH IN PARTICULAR, NEEDS TO BE STRENGTHENED.

PEOPLE ALONG THE POTOMAC HAVE LISTENED AND ARE RESPONDING.

-- THE NATIONAL SCIENCE FOUNDATION HAS UNDERTAKEN A STUDY OF THE DOWN TREND IN PRIVATE INDUSTRY RESEARCH AND IS EVEN CONSIDERING A CHANGE IN POLICIES SO IT CAN FINANCE MORE INDUSTRY RESEARCH.

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PRESENTED BY R. J. ALDRICH, ADMINISTRATOR, COOPERATIVE STATE RESEARCH SERVICE, U.S. DEPARTMENT OF AGRICULTURE, WASHINGTON, DC, AT THE 1978 INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES CONFERENCE, UNIVERSITY OF NEBRASKA, LINCOLN, NEBRASKA, JANUARY 9, 1978.



-- THE PRESIDENT, IN COMMENTS DURING THE SCIENCE AWARD CEREMONIES, NOVEMBER 22, 1977, SAID, "I'M ASSESSING EACH INDIVIDUAL AGENCY'S BUDGET THESE DAYS. . . . I DIRECTED THE OFFICE OF MANAGEMENT AND BUDGET TO BOOST THOSE RESEARCH AND DEVELOPMENT ITEMS MUCH HIGHER, AND THEY WILL BE FUNDED ACCORDINGLY."

FOR AGRICULTURE SPECIFICALLY:

- FIFTEEN MILLION DOLLARS WERE PROVIDED FOR A NEW COMPETITIVE GRANTS PROGRAM TO BE ADMINISTERED BY CSRS IN THE USDA.
- THE FARM BILL SIGNED INTO LAW SEPTEMBER 29 PROVIDES IN TITLE XIV A CHARTER FOR A CONSIDERABLE EXPANSION AND STRENGTHENING OF AGRICULTURAL RESEARCH, INCLUDING BASIC RESEARCH.

ALL OF US INVOLVED IN AGRICULTURAL RESEARCH, WELCOME THESE SIGNS THAT NEEDS FOR RESEARCH ARE BEING RECOGNIZED. AT THE SAME TIME, IT IS APPROPRIATE TO REMIND OURSELVES THAT ALL OF OUR PROBLEMS WON'T BE SOLVED WITH MORE FUNDS.

I HAVE A PERSONAL CONCERN THAT THE NATION'S AND AGRICULTURE'S NEEDS FOR SO-CALLED BASIC RESEARCH WILL NOT BE MET WITH MORE FUNDS ALONE.





AS A BACKGROUND FOR MY CONCERN, LET'S TAKE A LOOK AT THE RESEARCH SCENE PRE- AND POST-WORLD WAR II. PRE-WORLD WAR II BASIC RESEARCH WAS LARGELY FUNDED BY THE UNIVERSITIES AND THE PRIVATE FOUNDATIONS. THIS NATION'S BASIC RESEARCH EFFORT RESTED AT THE LABORATORY DOOR OF THOSE INSTITUTIONS' INDIVIDUAL SCIENTISTS. POST-WORLD WAR II, THIS HAS CHANGED UNTIL NOW MOST BASIC RESEARCH IS DIRECTLY DEPENDENT UPON FEDERAL GOVERNMENT FINANCING. THE MAJORITY OF THE BASIC RESEARCH IS STILL DONE IN THE UNIVERSITIES, BUT THE SOURCE OF SUPPORT, AND WITH IT THE POINT OF DECISION, HAS SHIFTED.

THE PICTURE IN THE AGRICULTURAL EXPERIMENT STATIONS HAS BEEN SIMILAR, BUT NOT SO EXTREME. PRE-WORLD WAR II, THERE WAS VERY LITTLE FEDERAL SUPPORT FOR RESEARCH IN THE STATE AGRICULTURAL EXPERIMENT STATIONS, OTHER THAN THAT ADMINISTERED THROUGH THE U.S. DEPARTMENT OF AGRICULTURE. BY 1975 SOMETHING OVER 34 MILLION DOLLARS SPENT BY THE STATE AGRICULTURAL EXPERIMENT STATIONS CAME FROM OTHER FEDERAL GRANTING AGENCIES. ANOTHER 13 PLUS MILLION DOLLARS OF YOUR 1975 EXPENDITURES WERE FROM THE COMBINED TOTAL OF USDA CONTRACTS AND COOPERATIVE AGREEMENTS AND FROM SPECIAL GRANTS ADMINISTERED BY CSRS. ADDITIONALLY, THERE HAS BEEN A GROWING TENDENCY FOR INCREASES UNDER HATCH TO BE EARMARKED. THUS, FOR AGRICULTURAL RESEARCH THERE ALSO HAS BEEN A SHIFTING OF SUPPORT AND DECISION AWAY FROM THE UNIVERSITY.





WHAT IS THERE IN THIS PICTURE WHICH IS CAUSE FOR CONCERN OVER BASIC RESEARCH?

-- FIRST AND FOREMOST, INCREASED OUTSIDE CONTROL FAILS TO ADEQUATELY RECOGNIZE A FUNDAMENTAL PRINCIPLE OF BASIC RESEARCH -- IDEAS ORIGINATE IN THE MINDS OF SCIENTISTS. OUR CURRENT SCENARIO IS ONE IN WHICH THIS ROLE FOR THE PERFORMING SCIENTIST TOO OFTEN IS SHIFTED TO SOMEONE ELSE. THIS NOT ONLY PRECLUDES SOME SCIENTISTS FROM PERFORMING AS GENERATORS OF IDEAS BUT REDUCES SUPPORT FOR HIGH RISK RESEARCH.

STATED CONCEPTUALLY: THERE HAS BEEN AND WILL ALWAYS BE A DIRECT RELATIONSHIP BETWEEN THE QUANTITY OF TRULY NEW DISCOVERIES AND THE NUMBERS OF SCIENTISTS WHO PARTICIPATE IN DECIDING WHAT RESEARCH WILL BE DONE, AND; CONTRACTS, GRANTS, SOMETIMES EVEN OUR OWN LONGSTANDING PROJECT SYSTEM IN THE STATE AGRICULTURAL EXPERIMENT STATIONS, ARE NOT DESIGNED TO SUPPORT RISK BUT RATHER TO MINIMIZE RISK -- THERE IS A RISK IN ALL RESEARCH, BUT THE HIGHEST RISK IS ASSOCIATED WITH OUR SO-CALLED BASIC RESEARCH.

ALL ONE HAS TO DO TO CONVINCE HIMSELF OF THE LATTER IS TO FOLLOW A GRANT ON ITS WAY FROM THE SCIENTIST'S LABORATORY THROUGH THE UNIVERSITY OFFICES AND THE FEDERAL AGENCY OFFICES. AT EVERY STOP ALONG THE WAY QUESTIONS ARE ASKED ABOUT THE LIKELIHOOD OF SUCCESS AND THE RETURNS WHICH CAN BE EXPECTED. THIS IS ESSENTIAL TO REALIZING



SPECIFIED OBJECTIVES IN AREAS SELECTED FOR EMPHASIS. BUT WE SHOULD REALIZE THAT THIS PROCESS ITSELF CAN BE A DETERRENT TO BASIC RESEARCH BREAKTHROUGHS AND THAT, OF COURSE, THE BREAKTHROUGHS WILL BE LIMITED TO THE PRIORITY AREAS SELECTED.

ONE OF THE MOST SERIOUS CONSEQUENCES OF THE MINIMUM RISK ASPECT OF GRANTS IS THE DISPROPORTIONATE FREEZING OUT OF THE YOUNGER SCIENTISTS. BY THE VERY FACT THAT HE IS NEW, THE YOUNG SCIENTIST ENTAILS A HIGHER RISK FOR RESOURCES COMMITTED TO HIM THAN DOES THE TRIED AND TRUE SENIOR SCIENTIST. THIS FACT WAS RECOGNIZED BY THE OFFICE OF TECHNOLOGY ASSESSMENT IN ITS REPORT "ORGANIZING AND FINANCING BASIC RESEARCH TO INCREASE FOOD PRODUCTION." THE REPORT, ISSUED IN JUNE 1977, INCLUDES THIS STATEMENT: "THE GREATEST PROGRESS IN BASIC RESEARCH IN THE NEAR FUTURE CAN BE ACHIEVED BY INCREASED FUNDING FOR THOSE SCIENTISTS AND GROUPS OF SCIENTISTS WHO NOW HAVE BOTH ONGOING BASIC RESEARCH PROGRAMS TO INCREASE FOOD PRODUCTION AND PROVEN COMPETENCE IN THE FIELD."

I HAVE NO QUARREL WITH THIS AS THE BEST WAY TO MAXIMIZE PROGRESS IN THE SHORT RUN WITHIN AREAS SELECTED FOR EMPHASIS. FURTHERMORE, I AM CONFIDENT THE SO-CALLED PEER REVIEW SYSTEM IDENTIFIES THE BEST PROPOSALS TO BE FUNDED. WE MUST NOT, HOWEVER, GET TRAPPED INTO BELIEVING THAT THIS IS THE BEST WAY TO REPLENISH OUR DEPLETED STOCK OF BASIC RESEARCH FINDINGS ON THE BROADER FRONT. IT MINIMIZES RATHER THAN MAXIMIZES THE NUMBER OF SCIENTISTS WHO CAN CONTRIBUTE. AND SCIENTISTS NOT WELL GOUNDED IN GRANTSMANSHIP, WHICH



MEANS MOST OF THOSE NEW TO THE RESEARCH SCENE, WILL BE PASSED BY WITHOUT EVER HAVING THE CHANCE TO DEVELOP THEIR GRANTSMANSHIP. THOSE YOUNG SCIENTISTS ARE OFTEN THE ONES WITH FRESH NEW IDEAS.

-- ANOTHER CONCERN WITH THE HEAVY DEPENDENCE ON THE FEDERAL GOVERNMENT FOR BASIC RESEARCH FUNDING AND MANAGEMENT IS THAT IT ALMOST COMPLETELY PRECLUDES PERSONAL CONTACT IN FUNDING DECISIONS. IN BASIC RESEARCH YOU ARE SUPPORTING THE SCIENTIST AND HIS IDEA. THE FURTHER REMOVED YOU GET FROM THE SCIENTIST IN DECIDING WHAT FUNDS HE SHALL HAVE TO RESEARCH HIS IDEA, THE LESS YOU WILL BE ABLE TO TREAT THE SCIENTIST AS A PART OF WHAT YOU ARE BUYING. OVERALL GRANT PROCEDURES, OF COURSE, RECOGNIZE THIS; THE PEER REVIEW SYSTEM, THE LISTING OF PUBLICATIONS, AND THE LIKE ARE WORTHY ATTEMPTS TO DEAL WITH IT. I SUBMIT, HOWEVER, THAT PARTICULARLY FOR OUR YOUNGER SCIENTISTS, THE DEPARTMENT HEAD IS IN A BETTER POSITION TO KNOW WHO SHOULD BE FUNDED FOR WHAT RESEARCH THAN IS THE DIRECTOR OF THE EXPERIMENT STATION, WHO KNOWS BETTER THAN THE UNIVERSITY'S VICE PRESIDENT FOR RESEARCH, WHO KNOWS BETTER THAN THE GRANTS MANAGER IN A FEDERAL AGENCY.

-- STILL ANOTHER CONCERN IS THAT FOR TIME. THE TIME TAKEN OUT OF THE HOURS AVAILABLE TO THE SCIENTIST, TO PREPARE GRANT PROPOSALS AND THEN DO ALL THE PAPER WORK ASSOCIATED WITH MANAGING THAT GRANT. AND THE TIME BETWEEN





THE INCEPTION OF AN IDEA IN THE SCIENTIST'S MIND AND ULTIMATE PROVISION OF FUNDS FROM A GRANTING AGENCY TO PURSUE THAT IDEA. BOTH ASPECTS OF TIME ARE DISINCENTIVES FOR BASIC RESEARCH.

-- A LAST CONCERN IS THE IMPLICATIONS FOR MANAGEMENT AND MANAGEMENT DECISIONS IN RESEARCH. THE EXPERIMENT STATION DIRECTOR AND EVEN THE DEPARTMENT HEAD CAN, IN EFFECT, BE BYPASSED AS DECISION-MAKERS IN THE FEDERAL GRANTING PROCESS. THE CONTRACTURAL ARRANGEMENT IS REALLY BETWEEN THE GRANTING AGENCY AND THE SCIENTIST IN MOST CASES. THE CONCERN HERE IS THAT WITHOUT THE DEPARTMENT CHAIRMAN AND THE EXPERIMENT STATION DIRECTOR RETAINING A DECISION-MAKING POSTURE IN THE GRANTS PROCESS, WE INDEED CANNOT HOPE TO ADEQUATELY RELATE GRANTS RESEARCH TO THE TOTAL RESEARCH EFFORT OF THE DEPARTMENT, THE STATION, AND THE NATION AS A WHOLE.

GIVEN THESE CONCERNS -- THAT THERE BE SUPPORT NOT JUST FOR CLEARLY IDENTIFIED RESEARCH BUT ALSO FOR SOME UNSOLICITED AND RISKIER IDEAS, THAT THE SCIENTIST MAINTAIN A STRONG HAND IN DECIDING WHAT RESEARCH WILL BE DONE, THAT YOUNGER SCIENTISTS HAVE OPPORTUNITY TO PARTICIPATE, THAT THE SCIENTIST'S TIME INVOLVED IN PREPARING A GRANT PROPOSAL AND HANDLING GRANT PAPERWORK BE MINIMUM, AND THAT THE LOCAL RESEARCH ADMINISTRATORS CONTINUE TO HAVE A HAND IN THE DECISION-MAKING OF WHO IS FUNDED TO DO WHAT RESEARCH -- GIVEN THESE CONCERNS ABOUT



ANY FEDERAL GRANT PROGRAM TO SUPPORT RESEARCH, WHAT CAN WE DO TO STRENGTHEN BASIC RESEARCH IMPORTANT TO AGRICULTURE -- WHETHER IT IS SUPPORTED VIA A GRANTS PROGRAM OR FORMULA FUNDING OR WHEREVER. I SEE TWO IMPORTANT INGREDIENTS -- PERSPECTIVE AND MANAGEMENT.

FIRST, THE PERSPECTIVE. WE -- COLLECTIVELY -- URGENTLY NEED A TOTAL FUNDING STRATEGY FOR THE AGRICULTURAL EXPERIMENT STATIONS IN THIS NATION. GRANT FUNDS, FORMULA FUNDS (HATCH, ET AL), REGIONAL RESEARCH FUNDS, STATE FUNDS NEED TO BE PUT IN PERSPECTIVE WITH ONE ANOTHER AND WITH THE KINDS OF RESEARCH NEEDS WE FACE. PROPER ATTENTION TO THE IMMEDIATE AS WELL AS THE LONG-RANGE PROBLEMS NEED TO BE INCLUDED IN THIS PERSPECTIVE.

THE HATCH-REGIONAL RESEARCH FUNDS MECHANISM IS UNIQUELY SUITED TO SOME OF THE RESEARCH PROBLEMS WE FACE -- BUT WE ARE NOT EFFECTIVELY USING THIS UNIQUENESS. GRANTS CAN CONCENTRATE EFFORTS ON EMERGING AND SPECIFIC PROBLEMS. BUT WHAT IS AN APPROPRIATE RELATIONSHIP BETWEEN GRANT FUNDS AND TOTAL FUNDS -- 1 TO 10? 1 TO 5? IS THERE AN APPROPRIATE RELATIONSHIP? WHY IS ANNUAL SUPPORT WITH FORMULA DISTRIBUTED FUNDS SO IMPORTANT TO A SOUND, TOTAL AGRICULTURAL RESEARCH EFFORT?



THESE ISSUES AND QUESTIONS COULD AND SHOULD BE ADDRESSED IN ARTICULATING A TOTAL FUNDING STRATEGY. IF CAREFULLY THOUGHT THROUGH, FOR EXAMPLE, THIS WOULD PROVIDE US THE PERSPECTIVE NEEDED TO POINT UP HOW ESSENTIAL FORMULA DISTRIBUTED FEDERAL FUNDS ARE TO A SUSTAINED BASIC RESEARCH EFFORT FOR AGRICULTURE.

FURTHER, A TOTAL FUNDING STRATEGY WOULD GIVE US SOMETHING SPECIFIC TO TAKE TO THOSE WHO HOLD THE PURSESTRINGS IN OUR NATION'S CAPITAL -- AND IN OUR STATE CAPITALS, TOO. RELEVANCE AND ACCOUNTABILITY IN RESEARCH ARE WORKING TERMS IN WASHINGTON -- AND APPROPRIATELY SO. WITHOUT SUCH A TOTAL PERSPECTIVE IN HAND, WE SIMPLY ARE NOT GIVING OUR LAWMAKERS WHAT THEY NEED TO SUPPORT US. AND, FOR BASIC RESEARCH, WITHOUT SUCH A STRATEGY WE INDEED ARE ACCEPTING AS FACT THAT IT CAN BEST BE FUNDED AND DIRECTED AT THE FEDERAL LEVEL. AS I HAVE TRIED TO POINT OUT, I THINK THIS IS WRONG.

AND NOW FOR THE OTHER INGREDIENT -- MANAGEMENT. IN THE FINAL ANALYSIS, HOW WELL WE MEET THE CHALLENGE TO STRENGTHEN BASIC RESEARCH IN AGRICULTURE WILL BE HEAVILY DEPENDENT UPON HOW WELL THE AGRICULTURAL EXPERIMENT STATION DIRECTORS MANAGE THEIR RESEARCH PROGRAMS. THIS IS ANOTHER WAY OF SAYING THAT, IN MY JUDGMENT, IT'S UP TO THE INDIVIDUAL EXPERIMENT STATION DIRECTOR WORKING





WITHIN THE FUNDING SCENARIO IN WHICH HE FINDS HIMSELF, TO MAKE SURE HIS MANAGEMENT OF RESOURCES AND SCIENTISTS IS SUCH THAT IT PROVIDES BOTH THE INCENTIVE AND THE SUPPORT FOR BASIC RESEARCH AT HIS INSTITUTION.

THE FLEXIBILITY TO DO THIS WILL HAVE TO BE CREATED AT THE LOCAL LEVEL, IN MY JUDGMENT. CONTINUED AVAILABILITY OF FORMULA FUNDS, OF COURSE, IS A MUST. BUT THEIR MERE AVAILABILITY DO NOT PROVIDE FLEXIBILITY -- ONLY APPROPRIATE MANAGEMENT WILL. THE BASIC RESEARCH "CONTINGENCY FUND" INITIATED RECENTLY AT THE MICHIGAN AGRICULTURAL EXPERIMENT STATION AND THE "SPECIAL ASSISTANCE FUND" ESTABLISHED ABOUT FIVE YEARS AGO AT THE MISSOURI AGRICULTURAL EXPERIMENT STATION ARE EXAMPLES OF WHAT CAN BE DONE.

I AM QUITE FAMILIAR WITH MOST OF THE ARGUMENTS OF WHY IT IS DIFFICULT FOR THE EXPERIMENT STATION DIRECTOR OR DEPARTMENT CHAIRMAN TO HAVE RISK CAPITAL AVAILABLE FOR HIGH RISK RESEARCH. MOST ARGUMENTS CAN BE WRAPPED UP IN THE STATEMENT "THAT SUPPORT FOR AGRICULTURAL RESEARCH HAS NOT KEPT UP WITH NEEDS, WITH THE RESULT THAT TODAY SOMETHING OVER 80 PERCENT OF ALL OF THE EXPENDITURES BY THE EXPERIMENT STATIONS ARE ON SALARIES. TRUE AS THAT STATEMENT IS, THAT EXPLANATION BECOMES ONLY AN EXCUSE WHEN, AFTER A REASONABLE TIME, THE DIRECTORS, INDIVIDUALLY AND COLLECTIVELY, FAIL TO EFFECTIVELY DEAL WITH ITS CONSEQUENCE. THERE HAS BEEN SUFFICIENT TIME FOR THE



PICTURE OF RESEARCH SUPPORT TO BE CLEAR; WE CANNOT TURN BACK THE RESEARCH FUNDING CLOCK -- GRANTS, EARMARKING, ACCOUNTABILITY ALL ARE WITH US TO STAY. WE NEED TO ACCEPT THIS SITUATION AND GET ON WITH OUR JOB.

THE NEED FOR INNOVATIVE RESEARCH MANAGEMENT HAS NEVER BEEN GREATER.

